LINKAGES BETWEEN FOOD CONSUMPTION PATTERNS, FOOD SECURITY AND SUSTAINABLE FOOD SYSTEMS

A
SYNOPSIS

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1. INTRODUCTION

Food is the basic necessity of any living being, to survive and to sustain. It is imperative to create and enforce legal entitlements and obligations to ensure that every person is assured physical, economical and social access to adequate food with dignity as is necessary to lead an active and healthy life[1]. While, the world currently produces enough food to feed everyone, over a billion men, women and children go to bed hungry every night. As of 2010, a total of 925 million suffered from chronic hunger: 578 million people in the Asia Pacific region, 239 million in Sub-Saharan Africa, 53 million in Latin America, 37 million in North and North East Africa, and just a little over 19 million in the developed countries (Shah, 2013). About 870 million people are estimated to have been undernourished (in terms of dietary energy supply) in the period 2010–12. This figure represents 12.5 percent of the global population, or one in eight people. The vast majority of these, 852 million, live in developing countries, where the prevalence of undernourishment is now estimated at 14.9 percent of the population (FAO, 2012).

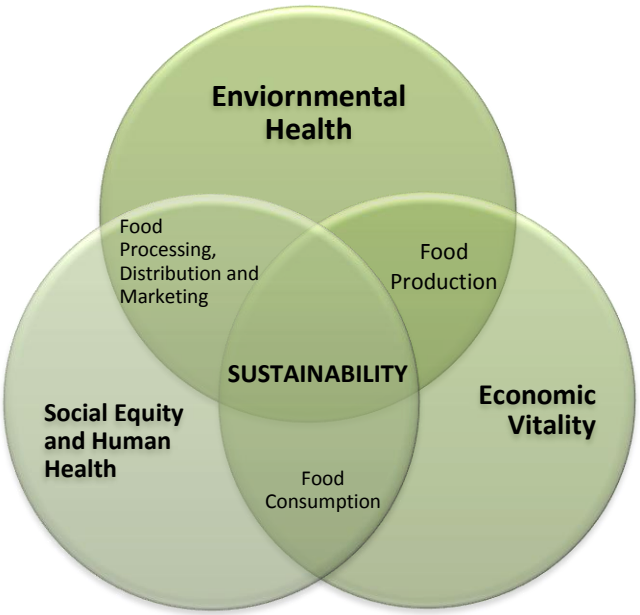
N.C. Saxena, a former bureaucrat who monitors food programs in India, stated that the poverty line has been historically set at "very very low levels" in India. Thus, the estimates of numbers living in poverty are meaningless in the current economic climate (Kala, 2013). India ranked 15th from the bottom in the 2012 Global Hunger Index[2], thereby reflecting that a large segment of society is suffering with vulnerability, however, on one hand, the economists, policy makers and leaders are still arguing to position the level of poverty line.

Acquiring righteous amount of food is a human privilege, which allows all human beings to live in dignity without anymore of hunger, food insecurity and malnutrition. The right to food is not about charity, but about ensuring that all people have the capacity to feed themselves in dignity (Ziegler, 2012)**.** In order to overcome the crucial problem of hunger, and to protect the rights of the citizens of our country; the Indian Government has increased the accessibility and also the production of food. In this context, the Millennium Development Goals were framed with a prime concern of halving the rate of poverty by 2015. In a meeting of state chief secretaries, the Indian Prime Minister, Dr. Manmohan

Singh admirably said, "In no case should we allow citizens to go hungry". Therefore, to accomplish this dream, the government has initiated the vision of Food Security through Sustainable Food Systems.

According to FAO (2008), Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. For realizing the food security objective, all four dimensions viz. Physical *Availability* of food, Economic and Physical *Access* to food, Food *Utilization* and *Stability* of the former three dimensions over time need to get fulfilled simultaneously. However, a sustainable food system is a collaborative network that integrates several components in order to enhance a community's environmental, economic and social well-being. It is built on principles that further the ecological, social, and economic values of a community and region (CFC, 2011).

Sustainable food system is a phenomenon which emphasizes on Environmental Health, Economic Vitality, and Human Health & Social Equity. When these three dimensions are more closely observed at micro level, further three sub and main aspects of the sustainable food system emerged viz. Food Production, Food Processing, Distribution and Marketing and Food Consumption. These three dimensions are directly interdependent on each other, each initiate the need of existence of other. The intersection fulfills the requirement of prevalence of Sustainable Food System. Therefore, a "community food system" is one in which sustainable food production; processing, distribution and consumption are integrated to enhance the environmental, economic, and social and nutritional health of a particular place (Garrett & Feenstra).



Source: Garret & Feenstra, Growing a Community Food

Figure 1: Sustainable Food System

The Government's initiations to achieve the vision of Food Secure India seems to be ineffective when researchers depicted the gap between demand and supply of food products and forecasted that it will continue if necessary actions will not be taken. This implies that in the years to come, the country will have to rely on imports of food items to meet the domestic requirement (Mittal, 2008; Kumar, P., et al., 2010).

The increased aggregate agri-product demand, and particularly through the consumption of resource intensive foodstuff, is directly responsible for the rising pressures on land, water and other natural resources used in the production of food. The agriculture sector is extremely resource intensive (Moomaw et al., 2012 cited from Nellemann et al., 2009). The pressure on agriculture to meet requirement of food will eventually force for over-exploitation of resources, and it will be a compromise with our own wellbeing and quality of life. The planet cannot afford to continue taking this path. A transition towards a more sustainable lifestyle is crucial to enable future generations to have access to their fair share of resources[3].

Having endeavored for many years to achieve the vision of Food Security and Sustainable Food System; it is still a dream for India. We are living in a world of food abundance, yet there is widespread of food insecurity. In analysis of this failure, it was found that government policies are predominantly focusing on the production side to increase the physical availability of food. Household consumption patterns and the drivers behind them were poorly understood. Population growth and economic development are driving consumption around the world and will continue to do so, as billions of consumers, especially in China, India and other emerging economies, add to the demand for goods and services. The market pressure created by competitive spending and conspicuous consumption turn the affluence of some into the exclusion of many[4].

According to the National Council for Applied Economic Research (NCAER), there are five classes of consumer households in India, categorized on the basis of the earned annual income, and so they range from the destitute to the highly affluent viz. the Rich (with annual income of Rs. 215,000 and more), the Consuming Class (Rs. 45-215,000 p.a.), the Climbers (Rs. 22-45,000 p.a.), the Aspirants (Rs. 16-22,000 p.a.), and the Destitute (below Rs. 16,000 p.a.). Consumers, being the most important part of the

Demand & Supply cycle, are primarily responsible to decide the demand pattern for food consumption and hence, they significantly affect the demand side initially, and sustainable food systems eventually.

According to the NSSO report (2013), consumer expenditure survey, the household monthly per capita expenditure (MPCE) at Modified Mixed Reference Period ($MPCE_{MMRP}$), there is around 33 per cent increase in the consumption expenditure from Rs.1984.46 in the 66th round to Rs.2629.65 in the 68th round. This consumption expenditure is classified under food and non food items. Share of expenditure on food items is 42.6 per cent of the total expenditure, which is significant amount to drive food security and food sustainability. The break-up of the data is as follows:

Table 1: Absolute and percentage break-up of $MPCE_{MMRP}$ by item group, All -India (Urban)

Item Groups	A	B	C	D	E	F	G	H	I	Food total
Monthly Per Capita Exp. (Rs.)	175	54	184	70	96	122	90	94	236	**1121**
Percentage to total MPCE	6.7	2	7	2.7	3.7	4.6	3.4	3.6	9	**42.6**

A-Cereals and cereals substitutes; **B**- Pulses & their products; **C**- Milk & milk products; **D**- Edible Oil; **E**- Egg, fish & meat; **F**- Vegetables; **G**- Fruits; **H**- Sugar, Salt and Spices; **I**- Beverages, refreshment, processed food

The world is currently facing economic, social, and environmental risks, best characterized by a "bubble" metaphor, based on greed and false expectations. A few enjoy immediate gains while the vast unsuspecting majority would pay huge future costs. These threats can interact catastrophically, unless they are addressed urgently and in an integrated fashion (Munasinghe, 2011). Unsustainable patterns of consumption have led to multiple problems threatening the future of humanity – like poverty, unequal consumption, resource scarcities, conflict and climate change.

The gap between production and consumption is same as of rural and urban. Consumers are no longer aware of how the food is produced, processed, packaged and transported. But the food consumption around the world has resulted in the change in direction of the food production. The actions that people take and choices they make, to consume certain

products and services or to live in certain ways rather than others, all have direct and indirect impacts on the environment, as well as on personal (and collective) well-being (Jackson, 2005). We often find that consumers are 'locked in' to unsustainable behaviours in spite of their own best intentions. The conspicuous consumption of food has always been an important indicator of status. Lavish food entertainment is part of the ancient tradition of food hospitality used mainly to impress strangers (guests). Thus, it is required to know that, 'Why do people consume the way they do? How can a person be encouraged, and facilitated towards more sustainable attitude, behaviour and lifestyle?'

For food consumption to be sustainable it has to be safe and healthy in amount and quality; and it has to be realized through means that are economically, socially, culturally and environmentally sustainable – minimizing waste and pollution and not jeopardizing the needs of others. Based on a broad understanding of sustainable consumption we define sustainable food consumption as a choice for food which is beneficial and life enhancing for individuals, society and the planet. Sustainable food consumption in such a comprehensive sense is, however, hardly on the political agenda (Reisch, 2010).

Considering Sustainable Consumption, the thought of proposing the Millennium Consumption Goals (MCGs) was substantiated in January 2011 in New York by Prof. Mohan Munasinghe, during the inter-sessional preparations for Rio+20 – the 2012 United Nations Conference on Sustainable Development in Brazil. [The key propositions are to] establish a set of Millennium Consumption Goals for the period 2012-2020 and for subsequent decades, complementing the Millennium Development Goals, and helping to ensure that the basic needs of the poor are met, [also to] preserve and strengthen earth's natural resource base on which human society depends. [It also aims to] enhance global prosperity, while ensuring a good quality of life and well being for everyone by 2020, improving intra- and inter-generational equity, and accelerating the shift to more sustainable consumption and production as an essential step towards the ultimate goal of sustainable development (MIND, 2011).

If the current population and consumption trends continue, humanity will need the equivalent of two Earths to support it by 2030. These consumption trends are of particular concern when considering issues relating to the availability of food. The most

vital of all sectors and yet the most resource intensive, a global discussion has begun in recognition of the need to address the unsustainable trajectory of the global food system. What has not been included in these discussions, however, is the need to go into the roots of the challenge: the increasing by resource- intensive consumption patterns that largely dictate the shape of our global food production system (Moomaw et al., 2012). Thus, to address this issue and to meet the research gap, the proposed study has been undertaken, with the broad objective, to analyze the food consumption patterns for realizing food security and sustainable food systems.

2. REVIEW OF LITERATURE

The framework of proposed research is based on reviews of existing literature, which are classified into two segments viz. Food Security and Sustainable Food Systems; and Consumer Behaviour and Consumption Patterns, in order to identify the imperative yet unaddressed areas and challenges.

2.1 Studies related to Food Security and Sustainable Food Systems

India is primarily associated with chronic poverty and inadequate dietary system. The reason for today's starvation [is] not only the scarcity of food grains alone, but also the lack of purchasing power **(Darshani, 2012)**. Campbell defined risk factors for food insecurity as anything that limits household resources (money, time, information, health, etc.) or the proportion of those resources available for food acquisition **(Olson, Rauschenbach, Frongillo, & Kendall, 1996).** It is necessary to determine which households are currently food-insecure and which are vulnerable to food insecurity. However, this is a complex undertaking as a plethora of definitions and indicators exist **(Hart, 2009).**

Punjab Minister for Finance, Excise and Taxation, Mian Mujtaba Shuja ur Rehman has said that increasing population is decreasing our food stocks and now about 70.7 million people are facing lack of food and starvation in the world, whereas, every 6th person in developing country is a victim of food shortage problems[5]. As the majority of Indians are directly or indirectly dependent on the agriculture, the diversification of agriculture, in general, increases sustainability and addresses the issues of food security through

employment and income generation **(Wani, et al. 2012).** There is need to increase crop diversification and improve allied activities **(Dev & Sharma, 2010)**. At the same time access to adequate food at a household level increasingly depends on how food markets and distribution systems function rather than only on total agro-food output **(Altman, Hart, & Jacobs, 2009).**

At the same time it is true that there is a limit to how much the earth can yield. There is a limit to cultivable land which is currently 11% of the 3.2 billion hectares of the total land area of the planet, the rest being taken up by forests, settlements of grass lands etc. There is also limit of water. If everybody was to start consuming as much as, say, Americans consume, than [then] obviously the earth will not be able to sustain it **(Mohanty, 2013).** Rising resource prices in recent years, combined with increasing global demand for resources due to a growing population and increasing wealth, have brought the issue of resource scarcity to the forefront **(Freibauer, et al., 2011) .** The supply-demand gap for food in India shows that in the short to medium-term, supply will meet demand but in the long run (2021 onwards); demand will outstrip supply for cereals, pulses, edible oil and sugar[6] **(Dev & Sharma, 2010).**

The fundamental building block of a vision for 2050 is that of "a world that is able to guarantee a growing population access to and control of safe, nutritious and culturally acceptable food and to manage the necessary balance between food demand, health and nutrition requirements and natural resources". Global systems for producing and distributing food must also be more resilient, more sustainable and more equitable **(Freibauer, et al., 2011). Mathe (2013)** stated that India's achievement of high growth in GDP consequently depended on agriculture. Hence, it is clear that achieving growth in food production and effective supply through public distribution system, to the needy people in the nation, will essentially lead to achieve food security. The PDS [Public Distribution System] plays a major role in this objective by ensuring access to certain minimum quantities of grain throughout the country and in all seasons at uniform prices. This goal is best achieved by reverting to a system of allocations of grain at uniform issue prices with universal coverage **(Ray & Ray, 2011).**

Narayanamoorthy & Aili (2012) opined that the policy makers of the country must recognise the fact [that] it is impossible to achieve complete food security without providing security to its own farmers in the form of better remuneration, at the same time the income growth and elimination of poverty is a "necessary" but not a "sufficient" condition for reducing undernourishment and malnourishment in India. There is strong need to create awareness about adequate intake of energy and protein and bring attitudinal change to raise energy intake **(Chand & Jumrani, 2013)**. While the country is striving towards ensuring food security, the nutritional capabilities do warrant due attention (**Arunachalam** & **Ayyappan**, **2013**).

NFSM [National Food Security Mission] offers much more than what earlier programmes had offered, especially, with respect to capacity building, monitoring, planning and execution **(Shah, 2012).** The problem of food security in India does not arise due to shortage of food but studies have thrown light on that, despite being a food surplus country, it has still not been able to curb its food grain wastage. A report by the Institution of Mechanical Engineers revealed that each year, wheat equivalent to Australia's annual grain production worth $10 billion, is wasted in India which can feed at least 250,000 hungry people per year[7]. In recent years despite ensuring ample availability of food, existence of food insecurity at the micro level in the county has remained a formidable challenge for India. In this context recently introduced National Food Security Bill (NFSB) aims to address this and marks a paradigm shift in addressing the problem of food security from current welfare approach to right based approach. This will possibly lower the entire system of food production, food procurement and distribution network existing for achieving food security on sustainable basis **(Arabi & Ramya, 2013).**

The government and academicians are focusing on to curb this problem. **Ramakrishna, et al. (2012)** have analyzed that women are more capable than men in terms of the ability to use and allocate the available resources, and thus leap a step towards improving food security. **Purushothaman, et al. (2013)** have stressed on the institutional efforts to promote sustainable agricultural practices. Despite we find the consumption dimension as completely unaddressed, till this day.

The researches on sustainability have clearly emphasized that sustainability is not about finding more food to feed more people. It's about better feeding people with the food that we have. In this direction, **Wright et al. (2013)** have found in their work that UK consumer food behaviours are currently misaligned with the building and maintenance of a more sustainable food system. The prevailing trends show inter-connected social, health, environmental and economic challenges at both - personal and national levels, with far-reaching implications. Drivers for less sustainable behaviour range from physical systems of food provision and financial access, through to changing work and leisure patterns, education, evolved taste preferences and declining access to and celebration of food preparation and consumption. **UNEP (2012)** had given the fact that we cannot successfully address unsustainable production patterns without acknowledging the consumptive drivers that shape and largely dictate the design of these production systems. We need to address the consumptive demand and productive supply elements systemically.

2.2 Studies related to Consumption Pattern and Consumer Behaviour

Nagla (2007) stressed that the cultural and social significance of food and eating habits in India is multifaceted and rich in meaning. Consumption is determined by socio-economic characteristics of household, effect of age, land ownership, income and access to public distribution system **(Kumar, et al., 2013). Power (2010)** also opined that food choices are deeply embedded in social norms, personal values, habits and aspirations; intervening to change dietary behaviour. The overlap between healthy diets and sustainable diets is a useful starting point. Social norms can be changed if European diets become environmentally sustainable. But **Verain, et al. (2011)** recommended that socio-demographic variables alone are not sufficient for segmenting sustainable food consumers. Personality characteristics, FRL [Food Related Lifestyle] variables and behavioural variables should all be considered in future studies on sustainability, which are, therefore, proposed to be included by the researcher in the present study.

Modern consumer society has its own logic, its own dynamics, its own epistemologies and ethics, its own myths and cosmologies. And all of these are identifiably different from those of other times and places. This perspective on the centrality of consumption in

modern society is obviously daunting. But it will not help policy- making to evade the issue: large-scale shifts in consumption patterns will inevitably involve engaging with the 'vanguard of history'. A concerted strategy is needed to make it easy to behave more sustainably: ensuring that incentive structures and institutional rules favour sustainable behaviour, enabling access to pro-environmental choice, engaging people in initiatives to help themselves, and exemplifying the desired changes within Government's own policies and practices **(Jackson, 2005).** Future research is needed to explore the characteristics of different sustainable food consumer segments with respect to their potential use in promoting sustainable development (**Verain, et al., 2011)**

The sensitization of (future) consumers to critical thinking, the collection and evaluation of relevant information, decision making, problem solving and engaging with sustainable consumption have to be started earlier, in childhood, and should cover all life stages as part of a lifelong process **(Süle, 2012). McDonald et al. (2012)** suggested that more research is needed to establish how people get into the three groups [Behaviour, Intention and Values] as considered in their typology. Our view of consumption accepts it as a socially constructed process. This raises the question that whether people could be effectively brought up, or otherwise socialised as grey consumers, or as Translators or Selectors.

"The changing consumption pattern of the middle-class throws light on the consciousness for better health and desire for intellectual uplift. This has inspired and motivated average households to give precedence to healthcare and education over food and beverages in some sense," said Assocham president Venugopal N Dhoot[8]. **Roux & Nantel (2009)** have found that a hierarchical view of "concern" or "consciousness" has important implications. Indeed, most field interventions that aim at raising consumers' "consciousness" seem to rely on more concrete actions first (e.g., making small behavioral changes), and then on more abstract actions (e.g., changing your mindset about consumption in general). In this direction, 'Food for Life' is a conscious organization, which has based its vision on an important observation that the problems of this world can be solved by adopting spiritual solutions. Specifically regarding world's hunger, Food for Life believes that when people of this world will recognize the spiritual equality of all beings, they will eventually learn to share equally in the bounty of the

earth, and only then will they experience genuine peace and prosperity **(Turner, P., 1999).** This approach paved the path to associate the aspect of consciousness of consumers with their consumption patterns.

Poverty, hunger and food insecurity are some of the issues that have received attention of various researchers. Some researchers focused on to find the solutions of these problems by increasing supply, diversifying the agriculture system, improving marketing patterns (PDS) and through institutional changes. Since the concept of Food Security and Sustainable Food Consumption are less explored areas in context of India. Consequently, there are relatively fewer studies available for retrospection. Hence, literature review unlocked these dimensions to be in the proposed study.

3. NEED OF THE STUDY

The survival of a nation depends on sustainable development which requires satisfying the needs and values of all. The rapid economic growth has witnessed the changing consumption pattern recently, and it has been laying a direct impact upon food prices, which has been consequently affecting food accessibility of the poor. Various researches to date have been undertaken the production aspect of food security and sustainability systems. The responsibility of sustainable food consumption remains largely unaddressed within the ongoing global discussion on food security. This omission does not contradict the fact that food consumption patterns and trends have a direct and significant influence on food production patterns and overall food security. We cannot ignore the fact that consumptive drivers shape and largely dictate the design of production systems. Despite of focusing only on productive supply, we need to address consumptive demand.

The rural population is now a days shifting towards urbanism. This rate of urbanization will have important impact especially in the sector of luxury items. These changes in consumption patterns brought about by urbanization can significantly affect food supply [through change in demand] (Sarin, & Barrows, 2005). The urban households have been undertaken for the study as they are expected to witness an increasing demand for all food products, despite their unawareness regarding where and how their foods are produced. They need to ensure that demand must not exceed the resource capacity of production. It requires conscious efforts at their end. Moreover, from sustainability

perspective, introducing with a conscious vision in the system particularly helpful since it allows consumers to develop their thinking on the systemic changes that may be necessary to re-orientate their food consumption patterns.

Thus, the following research questions required being addressed: How far the consumer behavior is accountable for food security and sustainable food systems? How can we visualize well established level of food security and an ingrained sustainable food system in local communities of the globalized era? How far the consumers' consciousness is associated with their consumption pattern and What are the barriers hindering the vision of food security and sustainable food systems? Therefore, to fill this research gap, and to seek attention of government and policy makers towards this consumption behavioural aspect, which is vital for realizing the vision of food security and sustainable food consumption, the present study has been intended and entitled as ***Linkages between Food Consumption Patterns, Food Security and Sustainable Food Systems.***

4. OBJECTIVES

To make the study scientific the following specific objectives have been framed:

1. To assess the food consumption and production status and trend.
2. To analyze the status of food security and sustainable food consumption at household level.
3. To assess the socio- demographic and economic profile of the consumers and its impact on their food consumption patterns.
4. To analyze consumers' approach towards sustainable food consumption
   - 4.1 To recognize the awareness, perspective and practices of consumers regarding sustainable food consumption.
   - 4.2 To determine the association between consumers' consciousness and sustainable food consumption patterns.
   - 4.3 To find factors influencing consumers' attitudinal- behavioural intention towards sustainable food consumption patterns.

5. To identify barriers to sustainable food consumption hindering the vision of food security and sustainable food systems.
6. To propose an effective consumer behavioural model to attain food security and sustainable food systems.

5. HYPOTHESES DEVELOPMENT

On the basis of available literature till date, and on account of the framed objectives, the following null hypotheses have been posited:

$H_0$1: Households are food secure and having sustainability in their consumption patterns.

$H_0$2: Socio- demographic and economic profile of consumers does not impact their consumption patterns.

$H_0$3: There are no differences among consumers' awareness, perspective and practices regarding sustainable food consumption.

$H_0$4: There is no association between consumers' consciousness and sustainable food consumption patterns.

6. RESEARCH METHODOLOGY

In order to find a systematic approach towards analyzing the Linkages between Food Consumption Patterns, Food Security and Sustainable Food Systems, and to make this study more relevant, scientific and specific, the following Research Methodology has been proposed. Special emphasis has been given to the urban households of Agra District.

6. 1. Research Type: Descriptive and Analytical

6.2. Research Design: The proposed research will be carried out in two phases. In first phase extensive literature will be reviewed to develop the outline of the model. In the second phase data will be collected, analyzed as follows:

6.2.1. Research Data:

This study will use a combination of *qualitative* and *quantitative* research methods. Qualitative methods, such as participant observation and focus group meetings, will be used more in the early stages of this study. These will be followed by a survey that will provide more precise quantitative data from larger samples of respondents.

The study will be based on *primary data* as well as *secondary data* sources. Secondary data will be collected through reputed Journals, Newspaper and Magazine Articles, Conference Papers, Government Reports, Related Books and Internet websites**,** whereas**,** primary data collection will follow a framework as mentioned here:

6.3. Sample Design:

6.3.1. Region of Study: The *Agra District* is selected purposively to know the implications of food security and sustainable food consumption patterns in local communities in a globalized era.

6.3.2. Sampling Techniques: Purposive and Cluster *(Annexure 1)*

6.3.3. Sample Size*:* 385 households *(Annexure 2and 3)*

Out of six sub-districts of Agra District; the sub district *Agra* has the greatest probability to be selected, as it contains maximum number of households. The clusters of five towns out of fifteen (one-third of the targeted population) will be selected on the basis of Probability Proportion to Size. Seventy-seven households from each selected town of Agra sub-district will randomly be selected. At a glance, the total 385 households will be selected as follows-

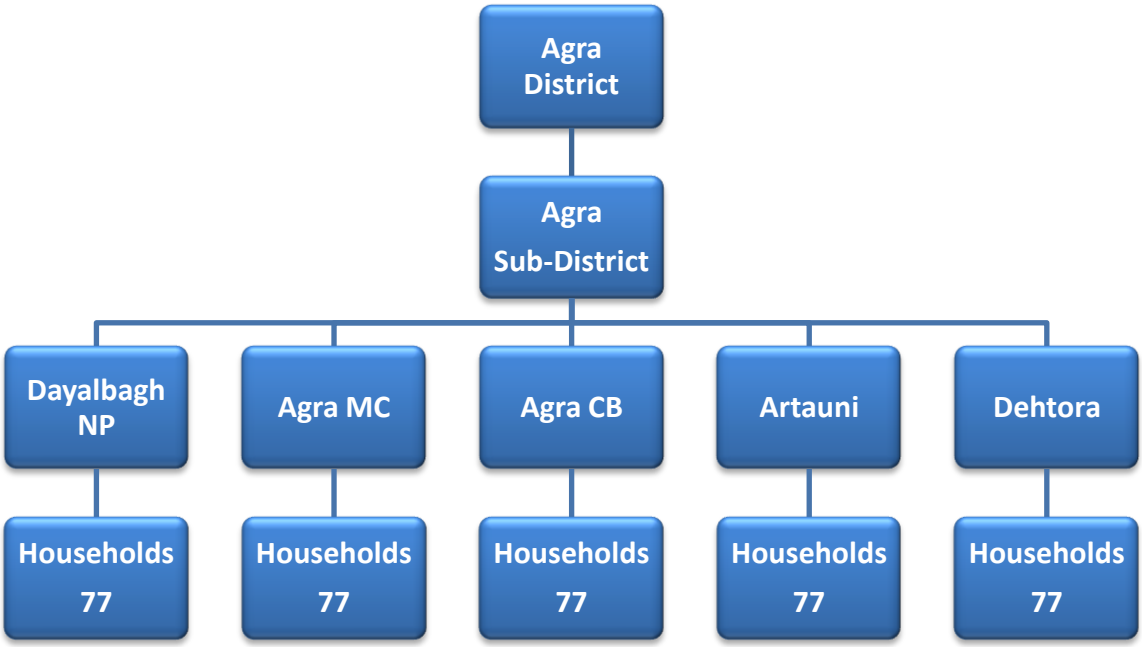


Figure 2: Sampling Framework for Research

6.7. Research Methods & Tools for Data Collection: Survey Method will be used with the help of Questionnaire / Schedule and Structured Interview.

6.8. Statistical Tools/ Techniques: Appropriate statistical tools and scales will be used to accomplish the objectives of the proposed study, such as: Household Dietary Diversity Score (HDDS), Five point Likert scale, Percentage, Averages, Correlation and Regression Analysis, Z test, ANOVA analysis and Kruskal Wallis test.

6.9. Variables for the proposed model:

Dependent Variable: Consumer Behaviour (Food Consumption Patterns)

Probable Independent Variables: Income, Price, Age, Sex, Education, Household structure and composition, Consumers' Consciousness

6.10. Computer Applications: MS-Excel and SPSS

PROPOSED CHAPTERS

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Methods and Materials

Chapter 4: Status of Food Consumption Patterns, Food Security and Sustainable Food Systems

Chapter 5: Consumers' Approach towards Sustainable Food Consumption

Chapter 6: Barriers to Sustainable Food Consumption

Chapter 7: Consumer Behavioural Model for Food Security and Sustainable Food Systems

Chapter 8: Conclusions

NOTES

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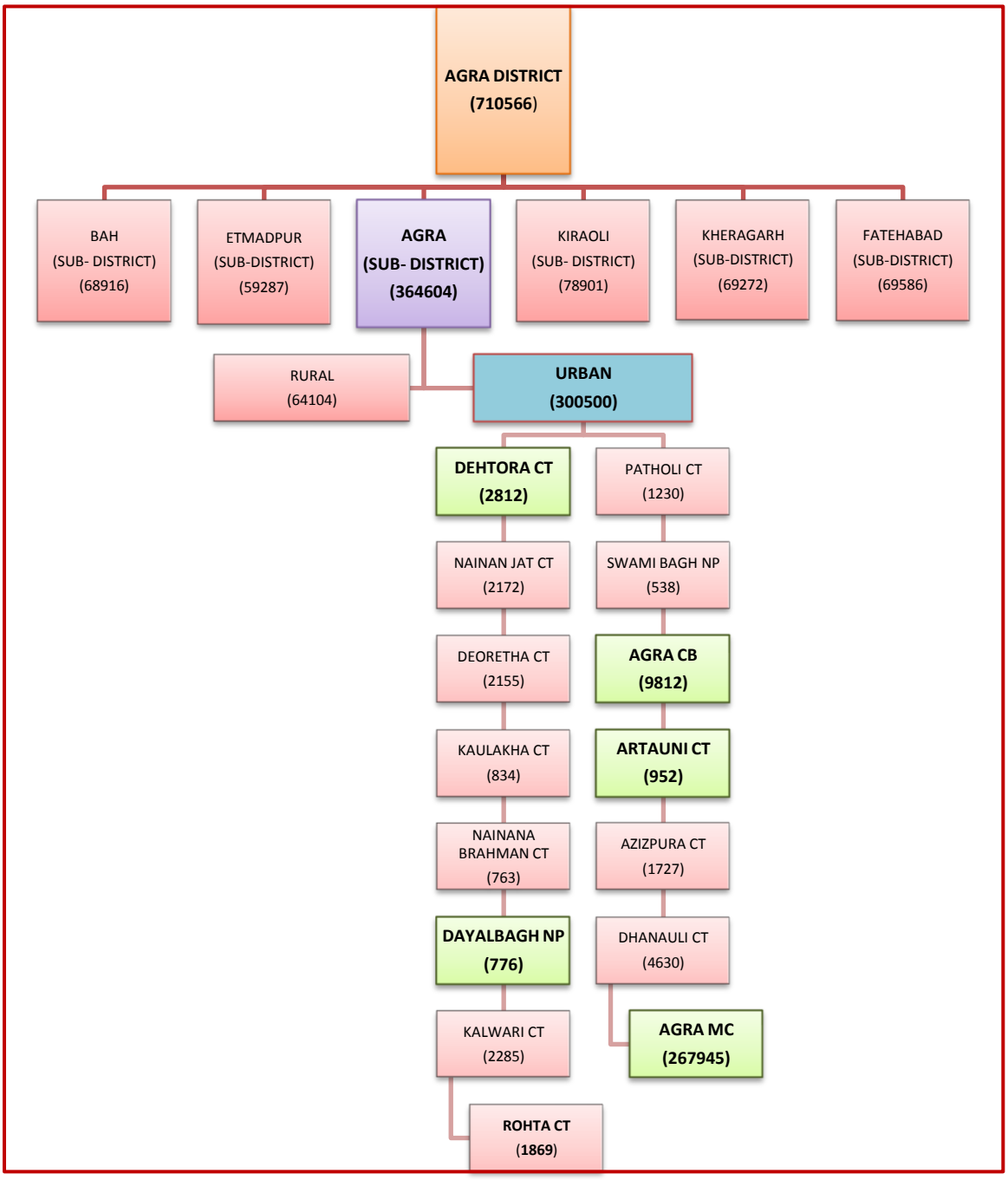
ANNEXURE 1

Cluster Sampling on the basis of Probability Proportion to Size:

Cluster Sampling on the basis of Probability Proportion to Size (PPS) will be the sampling procedure of the study. Under which the probability of a unit being selected is proportional to the size of the ultimate unit, giving larger clusters a greater probability of selection and smaller clusters a lower probability. In order to ensure that all units (Households) in the population will have the same probability of selection irrespective of the size of their cluster, each of the hierarchical levels prior to the ultimate level will be sampled according to the size of ultimate units it contains, but the same number of units will be sampled from each cluster at the last hierarchical level. It assures that those in larger sites have the same probability of getting into the sample as those in smaller sites, and vice verse.

ANNEXURE 2

An Overview of Sample Clusters Selection Process



CB- Cantonment Board, CT- Connecticut Town, NP- Nagar Panchayat, MC- Municipal Corporation
Figures in parentheses indicate total number of households.
Source –Census 2011, National Sample Survey Organisation

ANNEXURE 3

Determination of the sample size on the basis of Finite Population Correction

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where,
n' = sample size with finite population correction,
N = Population size, (Agra Sub District Urban households – 300500)
Z = Z statistic for a level of confidence, (1.96)
P = Expected proportion (in proportion of one), (0.5)
d = Precision (in proportion of one) (0.05)

$$n' = 383.67 \sim 384$$

The sample will be drawn from 5 towns of Agra Sub District; the sample size is taken as 385 (77 each) instead of 384 so that, there is equal distribution among the selected 5 towns.